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Publication number: **0 405 173 A2**

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## EUROPEAN PATENT APPLICATION

21 Application number: 90110367.1

51 Int. Cl.<sup>5</sup>: F04D 13/08

22 Date of filing: 31.05.90

30 Priority: 31.05.89 JP 135857/89

43 Date of publication of application:  
02.01.91 Bulletin 91/01

64 Designated Contracting States:  
DE FR GB

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54 Motor-operated pump of intank type.

57 A motor-operated pump of the in-tank type comprising a motor (1) for driving the pump, the motor having a commutator (3); a bracket (9) covering one end of the motor disposed adjacent to the commutator; a brush (4) held against the commutator (3) through a through hole formed in the bracket (9); and a bearing for supporting a shaft (5) of the motor. An annular projection (9d) is formed on a central portion of a surface of bracket (9) disposed in op-

posed relation to the commutator (3), and the annular projection is formed integrally with the bracket. Alternatively, an annular projection (3d) is formed on a central portion of the commutator (3) disposed in opposed relation to the bearing, and the annular projection is made of an electrically insulating material constituting the commutator, and is formed integrally with the commutator.

FIG. 1

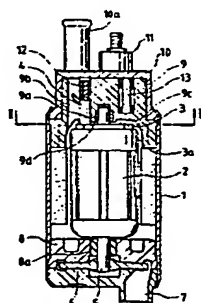
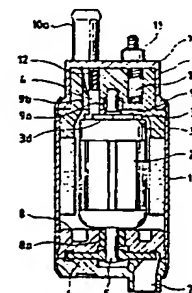


FIG. 3



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## MOTOR-OPERATED PUMP OF IN-TANK TYPE

### BACKGROUND OF THE INVENTION

This invention relates to a motor-operated pump of the in-tank type, and more particularly to a motor-operated pump of the in-tank type adapted to be sunk in a liquid fuel tank of a vehicle such as an automobile.

Fig. 6 is a cross-sectional view of a conventional motor-operated pump of the in-tank type as disclosed in Japanese Laid-Open (Kokai) Patent Application No. 272994/88. In this Figure, reference numeral 1 denotes a motor serving as a pump drive source, reference numeral 2 denotes a rotor of the motor 1, reference numeral 3 denotes a commutator of the rotor 2, reference numeral 4 denotes a brush held in contact with the commutator 3 so as to supply electric power to the rotor 2, reference numeral 5 denotes a shaft of the rotor 2, reference numeral 6 denotes an impeller connected to the shaft 5 and forming the pump, reference numeral 7 denotes an intake port of the pump, reference numeral 8 denotes a pump casing, reference numeral 9 denotes a bracket of the motor 1, reference numeral 10 denotes a cover-out, reference numeral 10a denotes a discharge port of the pump, reference numeral 11 denotes a terminal mounted on the cover-out 10 so as to be supplied with electric power from the exterior, reference numeral 12 denotes a brush spring for urging the brush 4 against the commutator 3, and reference numeral 13 denotes a noise prevention device for preventing electrical noises. Bearings 8a and 9a are mounted on the pump casing 8 and the bracket 9, respectively. The bracket 9 has a through hole 9b receiving the brush 4.

The conventional motor-operated pump of the in-tank type is constructed as described above, and when electric power is supplied to the terminal 11, the electric power is supplied to the rotor 2 via the noise prevention device 13, the brush 4 and the commutator 3. As a result, the rotor 2 is driven, and the impeller 6 connected to the rotor 2 is rotated, and fuel is drawn into the intake port 7 by the rotating impeller 7, and then is fed to an engine or the like (not shown) via the discharge port 10a.

In the above-described conventional motor-operated pump of the in-tank type, the side 3a of the commutator 3 held in sliding contact with the brush 4 are disposed in opposed relation to the bracket 9 and the bearing 9a. Therefore, when the axially-movable rotor 2 is moved due to vibrations or the like, the brush-sliding contact surface 3a of the commutator 3 is brought into contact with a confronting surface 9c of the bracket 9 which results in

a problem that the durability of the pump is adversely affected. Also, the brush-sliding contact surface 3a is brought into contact with the bearing 9a, which results in a problem that the performance of the pump is markedly lowered.

### SUMMARY OF THE INVENTION

The present invention has been made in order to overcome the above problems, and an object of the invention is to provide a motor-operated pump of the in-tank type in which a stable performance of the pump is achieved by avoiding a contact between opposed surfaces of a bracket and a commutator, thereby achieving a high reliability of the pump.

According to the present invention, there is provided a motor-operated pump of the in-tank type in which an annular projection is formed on a central portion of a surface of a bracket disposed in opposed relation to a commutator, and the annular projection is formed integrally with the bracket.

According to the invention, there is provided a motor-operated pump of the in-tank type in which an annular projection is made of an electrically insulating material constituting a commutator, and is formed integrally on a central portion of a brush-sliding contact surface of the commutator.

According to the first aspect, even if a rotor is moved due to vibrations, the annular projection is brought into contact with that portion of the commutator other than the brush-sliding contact surface of the commutator, thereby protecting the sliding contact surface. Further, the bearing is prevented from making contact with an electrical conductor portion of the commutator.

According to the second aspect, even if a rotor is moved due to vibrations, the annular projection is brought into contact with the bracket, thereby protecting the sliding contact surface. Further, the bearing is prevented from making contact with the sliding contact surface of the commutator.

### BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

Fig. 1 is a vertical cross-sectional view of one example of a first invention;

Fig. 2 is a cross-sectional view taken along the line II-II of Fig. 1;

Fig. 3 is a vertical cross-sectional view of one

example of a second invention;

Fig. 4 is a plan view of a commutator in Fig. 3;

Fig. 5 is a cross-sectional view taken along the line V-V of Fig. 4; and

Fig. 6 is a vertical cross-sectional view of a conventional motor-operated pump of the in-tank type.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figs. 1 and 2 show one example of a first aspect of the invention. In Figs. 1, 2 and 6, identical reference numerals denotes the same parts, respectively. An annular projection 9d is formed integrally with a bracket 9.

A fuel feed operation in the construction of this embodiment is the same as that described with reference to Fig. 6, and therefore explanation thereof is omitted here. However, the annular projection 9d is integrally formed on a central portion of a surface of the bracket 9 facing a commutator. Therefore, even when vibrations are imparted to the pump mounted on a vehicle or the like, the commutator-facing surface 9c of the bracket 9 will not be brought into contact with a brush-sliding contact surface 3a, and only the annular projection 9d is brought into contact with that portion of the commutator 3 other than the brush-sliding contact surface 3a.

Further, an electrically-conductive portion of the commutator 3 will not be brought into contact with a bearing 9a, thus preventing a electrical conductor member of the commutator 3 from being short-circuited via the bearing 9a.

Figs. 3 to 5 show one example of a second aspect of the invention, and in Figs. 3 to 6, identical reference numerals denotes the same parts, respectively.

A commutator 3 comprises a plurality of generally-fan shaped electrical conductor members 3b in sliding contact with a brush. Thus, the plurality of conductor members 3b constituting the commutator 3. An electrically insulating member 3c serves as a base member for the commutator 3, and holds the conductor members 3b. The commutator 3 has a central hole 3e through which a shaft 5 of a rotor 2 extends. An annular projection 3d is formed integrally with the insulating member 3c, and disposed in surrounding relation to the central hole 3e.

A fuel feed operation in the construction of this embodiment is the same as that described with reference to Fig. 6, and therefore explanation thereof is omitted here. However, the annular projection 3d of an electrically insulating material is integrally

formed on a central portion of a surface 3a of the commutator 3 disposed in sliding contact with a brush 4. Therefore, even when vibrations are imparted to the pump mounted on a vehicle or the like, the brush-sliding contact surface 3a of the commutator 3 will not be brought into contact with a bracket 9, and only the annular projection 3d is brought into contact therewith.

As described above, according to the first aspect of the invention, the annular projection is formed integrally on the central portion of the commutator-facing surface of the bracket, and therefore the surface (the conductor portion) of the commutator in sliding contact with the brush can be protected, and a mechanical load due to the contact between the commutator and the bracket can be kept to a minimum. Further, the conductor portion of the commutator will not be brought into contact with the bearing, thus preventing the conductor portion of the commutator from being short-circuited via the bearing. This construction provides advantages such as low costs and an enhanced reliability.

According to the second aspect of the invention, the annular projection of an electrically insulating material is formed integrally on the central portion of the brush-sliding contact surface of the commutator, and therefore the brush-sliding contact surface (the conductor portion of the commutator) can be protected, and a mechanical load due to the contact between the commutator and the brush can be kept to a minimum. Further, if the bearing should be moved toward the commutator, the commutator is prevented from being short-circuited via the bearing. This construction provides advantages such as low costs and an enhanced reliability.

#### **Claims**

1. A motor-operated pump of the in-tank type comprising a motor for driving the pump, said motor having a commutator; a bracket covering one end of said motor disposed adjacent to said commutator; a brush held against said commutator through a through hole formed in said bracket; and a bearing for supporting a shaft of said motor; wherein an annular projection is formed on a central portion of a surface of said bracket disposed in opposed relation to said commutator, and said annular projection is formed integrally with said bracket.
2. A motor-operated pump of the in-tank type comprising a motor for driving the pump, said motor having a commutator; a bracket covering one end of said motor disposed adjacent to said commutator; a brush held against said commutator through a through hole formed in said bracket; and a bearing for supporting a shaft of said motor; wherein

an annular projection is formed on a central portion of said commutator disposed in opposed relation to said bearing, and said annular projection is made of an electrically insulating material constituting said commutator, and is formed integrally with said commutator. 5

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FIG. 1

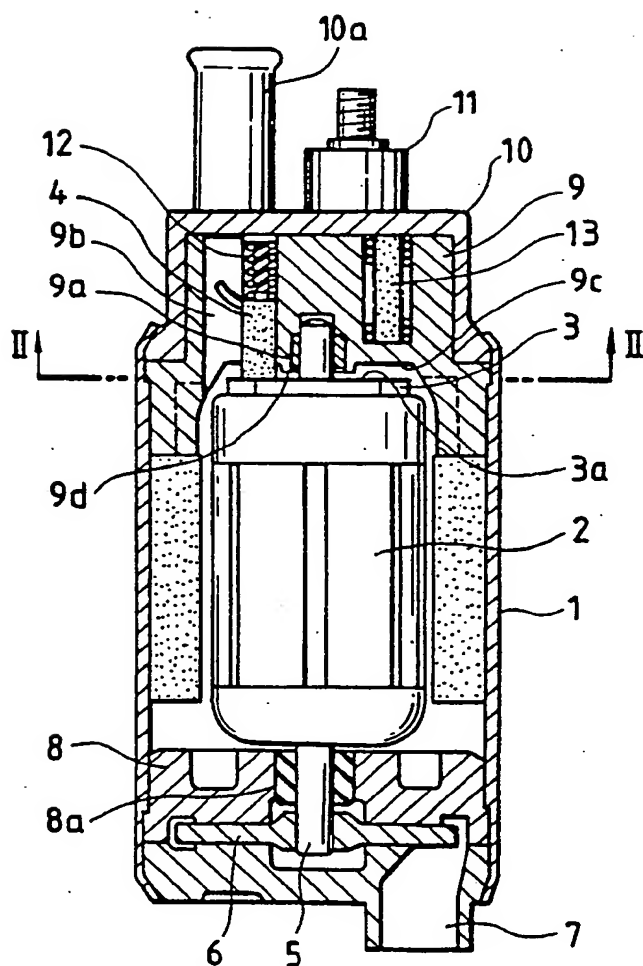


FIG. 2

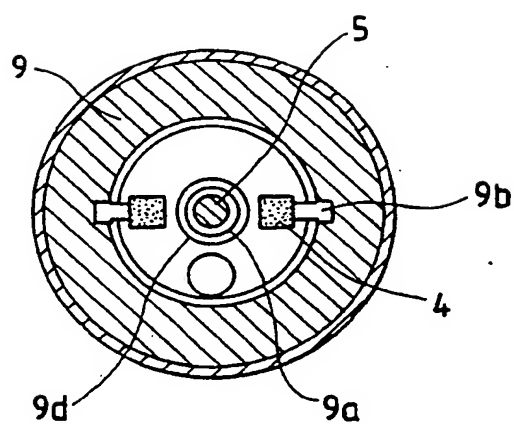


FIG. 3

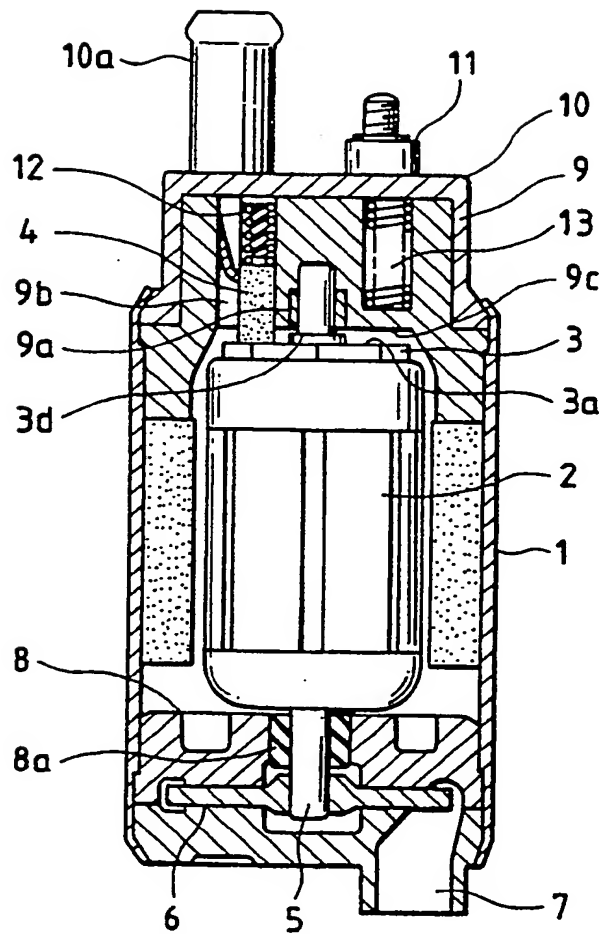


FIG. 4

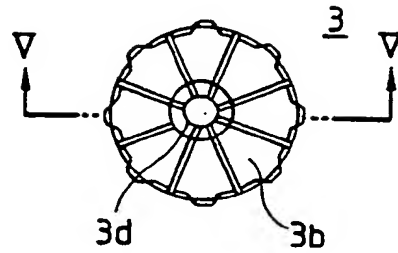


FIG. 5

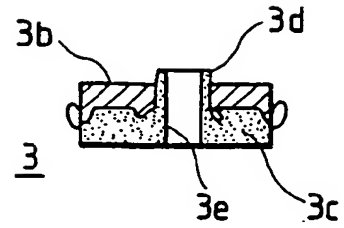
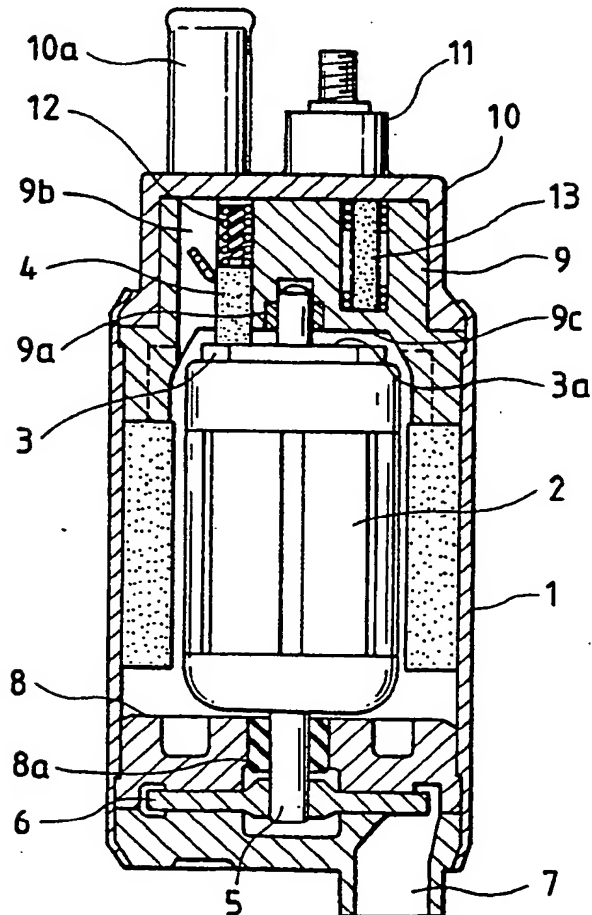


FIG. 6  
PRIOR ART





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European Patent Office  
Office européen des brevets



(11) Publication number:

**0 405 173 A3**

(12)

## EUROPEAN PATENT APPLICATION

(21) Application number: 90110367.1

(51) Int. Cl.<sup>5</sup>: F04D 13/08

(22) Date of filing: 31.05.90

(30) Priority: 31.05.89 JP 135857/89

(43) Date of publication of application:  
02.01.91 Bulletin 91/01

(84) Designated Contracting States:  
**DE FR GB**

(88) Date of deferred publication of the search report:  
28.08.91 Bulletin 91/35

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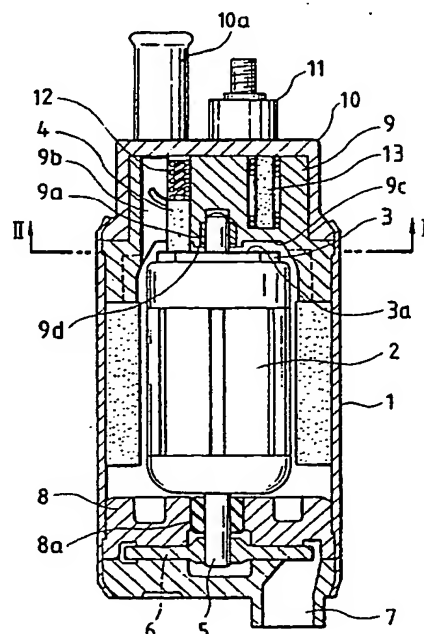
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(54) Motor-operated pump of intank type.

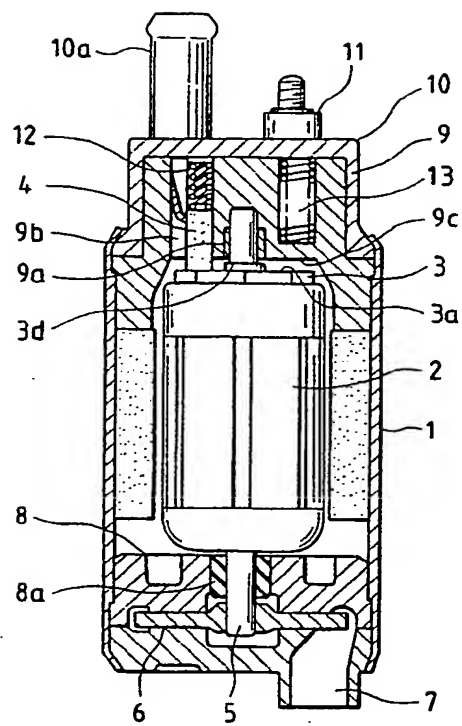
(57) A motor-operated pump of the in-tank type comprising a motor (1) for driving the pump, the motor having a commutator (3); a bracket (9) covering one end of the motor disposed adjacent to the commutator; a brush (4) held against the commutator (3) through a through hole formed in the bracket (9); and a bearing for supporting a shaft (5) of the motor. An annular projection (9d) is formed on a central portion of a surface of bracket (9) disposed in opposed relation to the commutator (3), and the annular projection is formed integrally with the bracket. Alternatively, an annular projection (3d) is formed on a central portion of the commutator (3) disposed in opposed relation to the bearing, and the annular projection is made of an electrically insulating material constituting the commutator, and is formed integrally with the commutator.

**FIG. 1**



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FIG. 3





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# EUROPEAN SEARCH REPORT

Application Number

EP 90 11 0367

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	BE-A- 348 448 (BOSCH) * Page 1, line 1 - page 2, line 19; figure 1 *	1	F 04 D 13/08
D,A	PATENT ABSTRACTS OF JAPAN, vol. 13, no. 76 (M-800)[3424], 21st February 1989, page 17 M 800; & JP-A-63 27 994 (NIPPON DENSO CO., LTD) 10-11-1988 * Whole abstract *	1	
A	FR-A-2 165 573 (BOSCH) * Page 1, lines 1-5; page 2, line 11 - page 3, line 16; figures *	1	
A	US-A-3 676 025 (SHULTZ) * Column 1, lines 31-35; column 4, line 73 - column 5, line 38; column 6, lines 45-61; figures 2,7-9 *	1,2	
A	US-A-1 592 326 (BASTIAN) * Page 1, lines 1-4,54-66,83-101; figures 1,2,8 *	2	
A	US-A-3 495 115 (LUCAS) * Column 1, lines 27-30; column 2, lines 19-70; column 3, lines 39-67; figures *	2	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 21-05-1991	Examiner ZIDI K.
<b>CATEGORY OF CITED DOCUMENTS</b>			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document.	

EPO FORM 1503 03.92 (P0601)



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## CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ All claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for all claims.
- ☐ Only part of the claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claims:
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

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## LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claim 1: Annular projection integral with a motor pump bracket.
2. Claim 2: Annular projection integral with a commutator.

- ☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☐ None of the further search fees has been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims: